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Washington State Department of Transportation

Tacoma Narrows / SR167 Hot Lane Integration

Interface Control Document



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1. INTRODUCTION

1.1 Overview

The Washington State Department of Transportation (WSDOT) will be implementing the following two toll collection systems in the near future:

- Tacoma Narrows Bridge
- SR167 high occupancy toll (HOT) lanes

Both systems will be able to collect tolls electronically using automatic vehicle identification (AVI) transponders. The sole method for collecting tolls on SR167 system will be through the use of AVI transponders on single occupancy vehicles. However, the SR167 system will not include a customer service center.

The Tacoma Narrows Bridge system includes a fully functional customer service and violations processing center. The WSDOT plans to enable AVI accounts maintained at this service center to be able to be used for paying tolls on SR167.

1.2 Purpose

To ensure a successful integration of the SR167 HOT lanes with the Tacoma Narrows Bridge TCAAS, the purpose of this Interface Control Document (ICD) is to:

- Specify a non proprietary solution for data exchanges between SR167 and the TCAAS
- Specify a solution that can be reused by WSDOT for other high occupancy toll facilities in Washington that may want to use the TCAAS for customer service functions
- Specify all data exchanges necessary to support appropriate customer service functions by staff at the Tacoma Narrows Bridge Customer Service Center
- Specify all data exchanges necessary to support high occupancy lane operation by SR167

1.3 Structure

Following this introduction, the document has been split into the following six sections:

- General information – describing general and processes that apply to all data exchanges
- Data exchanges – describes each data exchange as well as the layout and detail description of data included in the file

- File Transfer Flow - describes the process/methods/communications protocols/timings for the transmission of data/files
- Failure Path – describes processes for dealing with failed file transfers or failed processing of files
- Security requirements – describing processes/methods required for secure transmission of data/files
- Data Elements - provides additional definition of each data element referenced in the data exchanges

2. GENERAL INFORMATION

2.1 Data Exchanges

The Data Exchanges defined in this Interface Control Document are

Data Exchange	File Extension	Usage
Tag Status Data	FTSF	Created each day by the TCAAS to include all valid tags.
HOT Lane Transaction Data	FTXF	Created each day by the Facility (SR167) to include all transactions that need to be posted to an account maintained by TCAAS.
Transfer Complete	CHK	Created by the entity transferring a file to indicate that the file transfer is complete and the corresponding file can be validated and processed. The absence of this file indicates that the file transfer has not been completed.
Acknowledgment	ACK	Created by the entity downloading the file from the ftp server. It is used to confirm that the file has been validated. Error codes within the file provide additional information to the TCAAS or Facility.

An ftp server will be managed by the Tacoma Narrows CSC to enable the TCASS to receive data files from Facilities. This same ftp server will also include files from TCAAS that each Facility will be required to download.

2.2 Transmission Requirements

File transfers between the Facility and the TCAAS ftp server will be completed using the file transfer protocol (ftp).

The schedule for transmitting files between TCAAS and Facilities are

Data Exchange	Transmission Frequency	Notes
Tag Status Data	Once per day	Between 03:00 and 04:00.
HOT Lane Transaction Data	Once per day	Between 00:00 and 01:00.
Transfer Complete	Varies	One for each file transfer
Acknowledgment	Varies	One for each file transfer

2.3 Transaction Processing

Transactions from a Facility shall be sent to TCASS in a timely manner. The TCAAS shall reject original transactions that are older than 60 days.

Transactions that cannot be posted to accounts will result in the facility not receiving the amount due for the transaction.

2.4 Reporting Requirements

The TCAAS will provide the financial reporting for the SR167 HOT lanes. Several reports will be available in TCASS to identify the count of toll transactions that the TCAAS successfully posted for that Facility for a particular revenue date. Tolls, fees or other deductions will not be included in this report.

An additional report (Transponder Transaction Exception Report) will also be available to the Facility via TCAAS to identify those transactions that were not posted to an account. This report represents the amount of toll transactions that the Facility will not receive for a particular revenue date.

2.5 File Requirements

2.5.1 Format

Files will be well formatted XML files. The following rules will be applied for using XML tags:

- XML tags must be nested properly
- XML tags are case sensitive. Therefore, <tag> cannot be <Tag> or any derivation thereof
- XML tags must have a beginning and an end
- Each tag must be enclosed in < and >
- Optional tags do not need to be included. However if one of the detail records contains optional tags then all other detail records must include these tags even if there is null data for the tag.

2.5.2 Top Level (Root) Tags

The Top Level Tag in all files will include a description of the file type and the version number of the ICD to which the data complies. Spaces will be replaced by the underscore ("_") character.

For example, the transaction file that complies with version 1.2 of this document will have a top level tag as follows: <TRANSACTION_FILE_1.2>

2.5.3 Dates

Any dates used in file names of data elements will utilize the 24 hour clock. For example, 3:05pm will always be written as 15:05.

2.5.4 File Naming Conventions

Only uppercase characters shall be used in file names.

Compression

All files transmitted to the ftp server (except for the Transfer Complete and Acknowledgement Files) shall be compressed using a standard Lempel-Zif compression algorithm to yield a compression rate of at least 75%. The extension of these files will all be converted from [File Name].[File Type] to [File Name]_[File Type].ZIP.

2.5.5 Encryption

All files transmitted to the ftp server (except for the Transfer Complete file) shall be encrypted after they have been compressed and before they are transmitted to the ftp server. The security requirements for files are described in a later section of this document.

2.5.6 Archiving

All files on the ftp server will remain available for download for a period of seven (days). Files with an upload date that is older than seven (7) days will be moved from the ftp server to an archive folder. This archive folder will only be accessible by TCAAS.

Files in the ftp archive folder shall remain accessible via online storage for at least 60 days. Files shall remain accessible via offline storage (such as a tape backup) for at least 360 days after being deleted from the archive folder. These files will only be available to use in case of disputes between TCAAS and a Facility.

3. DATA EXCHANGES

3.1 Tag Status File

3.1.1 Description

The Tag Status File is created by TCAAS and transmitted to a Facility for processing. It will contain the tag status data for all tags associated with an account maintained at the TCAAS. Additional Tag information will also be included to enable the Facility to identify if the tag is a revenue or non-revenue tag.

3.1.2 Naming Convention

[FILE_DATE_TIME].FTSF

Example: For a Tag Status file created by at 02:00:05 on June 19, 2006 the name of the file be 20060619020005.FTSF.

3.1.3 Layout

```
<TAG_STATUS_FILE_1.0>
<HEADER>
    <FILE_DATE_TIME></FILE_DATE_TIME>
    <TOTAL_TAG_COUNT></TOTAL_TAG_COUNT>
    <TOTAL_TAG_COUNT_STATUS_0></TOTAL_TAG_COUNT_STATUS_0>
    <TOTAL_TAG_COUNT_STATUS_1></TOTAL_TAG_COUNT_STATUS_1>
    <TOTAL_TAG_COUNT_STATUS_2></TOTAL_TAG_COUNT_STATUS_2>
    <TOTAL_TAG_COUNT_STATUS_3></TOTAL_TAG_COUNT_STATUS_3>
    <TOTAL_TAG_COUNT_STATUS_4></TOTAL_TAG_COUNT_STATUS_4>
    <TOTAL_TAG_COUNT_STATUS_5></TOTAL_TAG_COUNT_STATUS_5>
</HEADER>
<DETAIL_DATA>
    <TAG>
        <RECORD_ID></RECORD_ID>
        <TAG_AGENCY_ID></TAG_AGENCY_ID>
        <TAG_PROTOCOL></TAG_PROTOCOL>
        <TAG_REVENUE_TYPE></TAG_REVENUE_TYPE>
        <TAG_NUMBER></TAG_NUMBER>
        <TAG_HW_SERIAL_NUMBER></TAG_HW_SERIAL_NUMBER>
        <TAG_CLASS></TAG_CLASS>
        <TAG_STATUS></TAG_STATUS>
    </TAG>
</DETAIL_DATA>
<FOOTER>
</FOOTER>
</TAG_STATUS_FILE_1.0>
```

3.1.4 Data Elements

3.1.4.1 Top Level (Root) Tag

The file description used in the top level xml tag will be <TAG_STATUS_FILE_x.x> where x.x is the version number of the ICD with which the file will comply.

3.1.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed below are the data elements for the <HEADER> record in a Tag Status File.

Data Element Name	Mandatory
FILE_DATE_TIME	Yes
TAG_TOTAL_COUNT	Yes
TAG_COUNT_STATUS_0	Yes
TAG_COUNT_STATUS_1	Yes
TAG_COUNT_STATUS_2	Yes
TAG_COUNT_STATUS_3	Yes
TAG_COUNT_STATUS_4	Yes
TAG_COUNT_STATUS_5	Yes

3.1.4.3 Detail Data

Each Tag record will be contained within a <TAG> record. Listed below are the data elements for the <TAG> record.

Data Element Name	Mandatory
RECORD_ID	Yes
TAG_AGENCY_ID	Yes
TAG_PROTOCOL	Yes
TAG_REVENUE_TYPE	Yes
TAG_NUMBER	Yes
TAG_HW_SERIAL_NUMBER	No
TAG_CLASS	Yes
TAG_STATUS	Yes

3.1.4.4 Footer

Each file will contain a footer record with no required data elements. Future enhancements to this interface control document may necessitate the inclusion of tags in this record. However, for this version of the interface control document, no tags are required to be included in the footer record.

3.1.5 Example

```
<?xml version="1.0"?>
<TAG_STATUS_FILE_1.0 xmlns="http://localhost/SR167"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation = "http://localhost/SR167
    http://localhost/SR167/tagStatusFileSchema.xsd">
<HEADER>
    <FILE_DATE_TIME>2006-07-27T00:10:10</FILE_DATE_TIME>
    <TOTAL_TAG_COUNT>2</TOTAL_TAG_COUNT>
    <TOTAL_TAG_COUNT_STATUS_0>0</TOTAL_TAG_COUNT_STATUS_0>
    <TOTAL_TAG_COUNT_STATUS_1>1</TOTAL_TAG_COUNT_STATUS_1>
    <TOTAL_TAG_COUNT_STATUS_2>1</TOTAL_TAG_COUNT_STATUS_2>
    <TOTAL_TAG_COUNT_STATUS_3>0</TOTAL_TAG_COUNT_STATUS_3>
    <TOTAL_TAG_COUNT_STATUS_4>0</TOTAL_TAG_COUNT_STATUS_4>
    <TOTAL_TAG_COUNT_STATUS_5>0</TOTAL_TAG_COUNT_STATUS_5>
</HEADER>
<DETAIL_DATA>
    <TAG>
        <RECORD_ID>1</RECORD_ID>
        <TAG_AGENCY_ID>218</TAG_AGENCY_ID>
        <TAG_PROTOCOL>SEGO</TAG_PROTOCOL>
        <TAG_REVENUE_TYPE>REVENUE</TAG_REVENUE_TYPE>
        <TAG_NUMBER>1012</TAG_NUMBER>
        <TAG_HW_SERIAL_NUMBER>010000DA00700112</TAG_HW_SERIAL_NUMBER>
        <TAG_CLASS>2</TAG_CLASS>
        <TAG_STATUS>1</TAG_STATUS>
    </TAG>
    <TAG>
        <RECORD_ID>2</RECORD_ID>
        <TAG_AGENCY_ID>219</TAG_AGENCY_ID>
        <TAG_PROTOCOL>CVISN</TAG_PROTOCOL>
        <TAG_REVENUE_TYPE>NONREVENUE</TAG_REVENUE_TYPE>
        <TAG_NUMBER>671861690</TAG_NUMBER>
        <TAG_HW_SERIAL_NUMBER></TAG_HW_SERIAL_NUMBER>
        <TAG_CLASS>2</TAG_CLASS>
        <TAG_STATUS>2</TAG_STATUS>
    </TAG>
</DETAIL_DATA>
<FOOTER>
</FOOTER>
</TAG_STATUS_FILE_1.0>
```

3.2 Transaction File

3.2.1 Description

The Transaction File is created by the Facility and transmitted to the TCAAS for processing. It will contain all the required transaction data occurring at the Facility for tags belonging to the TCAAS so that TCAAS can apply the transactions against the appropriate customer account.

3.2.2 Naming Convention

[FAC_ID]_[FILE_DATE_TIME].FTXF

Example: For a Transaction File created by Facility 45 at 00:43:21 on November 31, 2006 the name of the file be 045_20061131004321.FTXF.

3.2.3 Layout

```
<TRANSACTION_FILE_1.0>
  <HEADER>
    <FAC_ID></FAC_ID>
    <FILE_ID></FILE_ID>
    <FILE_DATE_TIME></FILE_DATE_TIME>
    <TRANSACTION_COUNT></TRANSACTION_COUNT>
    <TRANSACTION_SUM></TRANSACTION_SUM>
  </HEADER>
  <DETAIL_DATA>
    <TRANSACTIONS>
      <RECORD_ID></RECORD_ID>
      <TRANSACTION_ID></TRANSACTION_ID>
      <TAG_AGENCY_ID></TAG_AGENCY_ID>
      <TAG_NUMBER></TAG_NUMBER>
      <ENTRY_TRANS_DATE_TIME></ENTRY_TRANS_DATE_TIME>
      <ENTRY_PLAZA_NO></ENTRY_PLAZA_NO>
      <ENTRY_LANE_NO></ENTRY_LANE_NO>
      <TX_CLASS></TX_CLASS>
      <AVC_CLASS></AVC_CLASS>
      <TAG_CLASS></TAG_CLASS>
      <TOLL></TOLL>
      <SPECIAL_RULE_APPLIED></SPECIAL_RULE_APPLIED>
      <TRIP_SPEED></TRIP_SPEED>
    </TRANSACTIONS>
  </DETAIL_DATA>
  <FOOTER>
  </FOOTER>
</TRANSACTION_FILE_1.0>
```

3.2.4 Data Elements

3.2.4.1 Top Level (Root) Tag

The file description used in the top level xml tag will be <TRANSACTION_FILE_x.x> where x.x is the version number of the ICD with which the file will comply.

3.2.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed below are the data elements for the <HEADER> record in a Transaction File.

Data Element Name	Mandatory
FAC_ID	Yes
FILE_ID	Yes
FILE_DATE_TIME	Yes
TRANSACTION_COUNT	Yes
TRANSACTION_SUM	Yes

3.2.4.3 Detail Data

Each transaction record will be contained within a <TRANSACTION> record. Listed below are the data elements for the <TRANSACTION> record.

Data Element Name	Mandatory
RECORD_ID	Yes
TRANSACTION_ID	Yes
TAG_AGENCY_ID	Yes
TAG_NUMBER	Yes
ENTRY_TRANS_DATE_TIME	Yes
ENTRY_PLAZA_NO	Yes
ENTRY_LANE_NO	Yes
TX_CLASS	Yes
AVC_CLASS	No
TAG_CLASS	No
TOLL	Yes
SPECIAL_RULE_APPLIED	Yes
TRIP_SPEED	No

3.2.4.4 Footer

Each file will contain a footer record with no required data elements. Future enhancements to this interface control document may necessitate the inclusion of tags in this record. However, for this version of the interface control document, no tags are required to be included in the footer record.

3.2.5 Example

```
<?xml version="1.0"?>
<TRANSACTION_FILE 1.0 xmlns="http://localhost/SR167"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation =
```

```
"http://localhost/SR167 http://localhost/SR167/transactionFileSchema.xsd">
<HEADER>
    <FAC_ID>100</FAC_ID>
    <FILE_ID>987654321</FILE_ID>
    <FILE_DATE_TIME>2006-06-19T00:43:21</FILE_DATE_TIME>
    <TRANSACTION_COUNT>2</TRANSACTION_COUNT>
    <TRANSACTION_SUM>1.50</TRANSACTION_SUM>
</HEADER>
<DETAIL_DATA>
    <TRANSACTION>
        <RECORD_ID>1</RECORD_ID>
        <TRANSACTION_ID>123456788</TRANSACTION_ID>
        <TAG_AGENCY_ID>218</TAG_AGENCY_ID>
        <TAG_NUMBER>1012</TAG_NUMBER>
        <ENTRY_TRANS_DATE_TIME>2006-06-18T09:12:15</ENTRY_TRANS_DATE_TIME>
        <ENTRY_PLAZA_NO>102</ENTRY_PLAZA_NO>
        <ENTRY_LANE_NO>1</ENTRY_LANE_NO>
        <TX_CLASS>1</TX_CLASS>
        <AVC_CLASS>1</AVC_CLASS>
        <TAG_CLASS>1</TAG_CLASS>
        <TOLL>1.50</TOLL>
        <SPECIAL_RULE_APPLIED>SR167-Y</SPECIAL_RULE_APPLIED>
        <TRIP_SPEED>75</TRIP_SPEED>
    </TRANSACTION>
    <TRANSACTION>
        <RECORD_ID>2</RECORD_ID>
        <TRANSACTION_ID>123456789</TRANSACTION_ID>
        <TAG_AGENCY_ID>219</TAG_AGENCY_ID>
        <TAG_NUMBER>671861690</TAG_NUMBER>
        <ENTRY_TRANS_DATE_TIME>2006-06-18T09:35:58</ENTRY_TRANS_DATE_TIME>
        <ENTRY_PLAZA_NO>102</ENTRY_PLAZA_NO>
        <ENTRY_LANE_NO>1</ENTRY_LANE_NO>
        <TX_CLASS>1</TX_CLASS>
        <AVC_CLASS>1</AVC_CLASS>
        <TAG_CLASS>1</TAG_CLASS>
        <TOLL>0.00</TOLL>
        <SPECIAL_RULE_APPLIED>SR167-Y</SPECIAL_RULE_APPLIED>
        <TRIP_SPEED>32</TRIP_SPEED>
    </TRANSACTION>
    </DETAIL_DATA>
    <FOOTER>
    </FOOTER>
</TRANSACTION_FILE_1.0>
```

3.3 Transfer Complete File

3.3.1 Description

The Transfer Complete File is created by the originating organization immediately after it has completed the upload of a file to the ftp server. It will contain the name of the file and type of file for which the file transfer has just been completed. The existence of this file on the ftp server will indicate that the file recently transferred is ready to be validated by the receiving organization.

3.3.2 Naming Convention

[FILENAME_FILETYPE].CHK

Example 1: For a Tag Status file (20060619020005.ftsf) that has been recently transferred in its entirety to a Facility, the name of the transfer complete file will be 20060619020005_FTSF.CHK.

Example 2: For a Transaction File (045_20061131124321.ftxf) that has been recently transferred in its entirety to the TCAAS, the name of the transfer complete file will be 045_20061131124321_FTXF.CHK.

3.3.3 Layout

```
<TRANSFER_COMPLETE_1.0>
  <DETAIL_DATA>
    <FILE>
      <FILENAME></FILENAME>
      <FILETYPE></FILETYPE>
    </FILE>
  </DETAIL_DATA>
</TRANSFER_COMPLETE_1.0>
```

3.3.4 Data Elements

3.3.4.1 Top Level (Root) Tag

The file description used in the top level xml tag will be <TRANSFER_COMPLETE_x.x> where x.x is the version number of the ICD with which the file will comply.

3.3.4.2 Detail Data

The one file record in the transfer complete file will be contained within a <FILE> record. Listed below are the data elements for the <FILE> record.

Data Element Name	Mandatory
FILENAME	Yes
FILETYPE	Yes

3.3.5 Example

```
<?xml version="1.0"?>
<TRANSFER_COMPLETE_1.0 xmlns="http://localhost/SR167"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation =
  "http://localhost/SR167 http://localhost/SR167/chkFileSchema.xsd">
  <DETAIL_DATA>
    <FILE>
      <FILENAME>045_20061131124321</FILENAME>
      <FILETYPE>FTXF</FILETYPE>
    </FILE>
  </DETAIL_DATA>
</TRANSFER_COMPLETE_1.0>
```

3.4 Acknowledgement File

3.4.1 Description

The Acknowledgement File is created by the receiving organization after it has validated another file such as the Tag Status File or Transaction File. It will contain the name of the file and type of file that has been validated. Additional return code data will also be included to indicate success or failures involved in validating the file.

3.4.2 Naming Convention

[FROM_FACILITY_ID]_[FILENAME]_[FILETYPE]_[FILE_DATE_TIME].ACK

Example 1: For a Tag Status file (20060619020005.fts) that has been validated by a Facility (045) and the acknowledgement file was created at 02:34:01 on June 19, 2006, the name of the acknowledgement file will be 045_20060619020005_FTSF_20060619023401.ACK.

Example 2: For a Transaction File (045_20061131004321.ftxf) that has been validated by TCAAS and the acknowledgement file was created at 00:52:35 on November 31, 2006,, the name of the acknowledgement file will be 216_045_20061131004321_FTXF_20061131005235.ACK.

3.4.3 Layout

```
<ACKNOWLEDGEMENT_1.0>
<HEADER>
    <FILENAME></FILENAME>
    <FILETYPE></FILETYPE>
    <RETURN_CODE></RETURN_CODE>
    <NUM_ERRORS></NUM_ERRORS>
</HEADER>
<DETAIL_DATA>
    <ERROR>
        <RECORD_ID></RECORD_ID>
        <DESCRIPTION></DESCRIPTION>
    </ERROR>
</DETAIL_DATA>
<FOOTER>
</FOOTER>
</ACKNOWLEDGEMENT_1.0>
```

3.4.4 Data Elements

3.4.4.1 Top Level (Root) Tag

The file description used in the top level xml tag will be <ACKNOWLEDGEMENT_x.x> where x.x is the version number of the ICD with which the file will comply.

3.4.4.2 Header

Each file will contain a header record containing summary data applicable to a particular . Listed below are the data elements for the <HEADER> record.

Data Element Name	Mandatory
FILENAME	Yes
FILETYPE	Yes
RETURN_CODE	Yes
NUM_ISSUES	Yes

3.4.4.3 Detail Data

Each error or informational warning will be contained within an <ISSUE> record. Listed below are the data elements for the <ISSUE> record.

Data Element Name	Mandatory
RECORD_ID	No
DESCRIPTION	No

3.4.4.4 Footer

Each file will contain a footer record with no required data elements. Future enhancements to this interface control document may necessitate the inclusion of tags in this record. However, for this version of the interface control document, no tags are required to be included in the footer record.

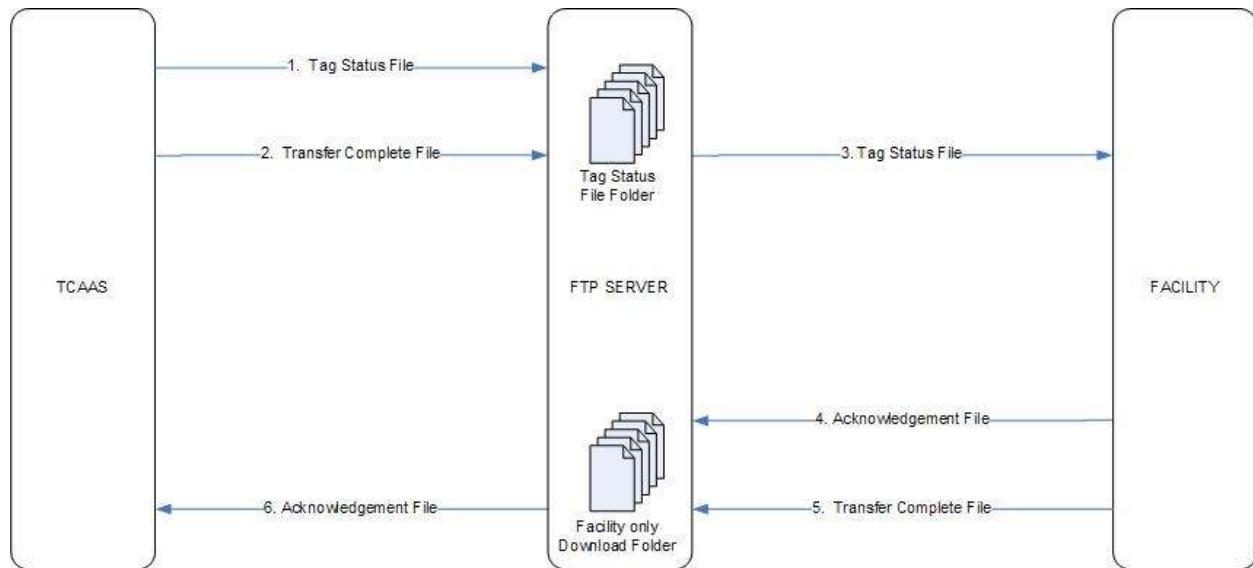
3.4.5 Example

```
<?xml version="1.0"?>
<ACKNOWLEDGEMENT_1.0 xmlns="http://localhost/SR167" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation = "http://localhost/SR167 http://localhost/SR167/ackFileSchema.xsd">
<HEADER>
    <FILENAME>20060619020005 </FILENAME>
    <FILETYPE>FTSF</FILETYPE>
    <RETURN_CODE>31</RETURN_CODE>
    <NUM_ERRORS>1</NUM_ERRORS>
</HEADER>
<DETAIL_DATA>
    <ERROR>
        <RECORD_ID>1</RECORD_ID>
        <DESCRIPTION>TAG NUMBER FIELD FAILED VALIDATION</DESCRIPTION>
    </ERROR>
</DETAIL_DATA>
<FOOTER>
</FOOTER>
</ACKNOWLEDGEMENT_1.0>
```

4. FILE TRANSFER FLOW

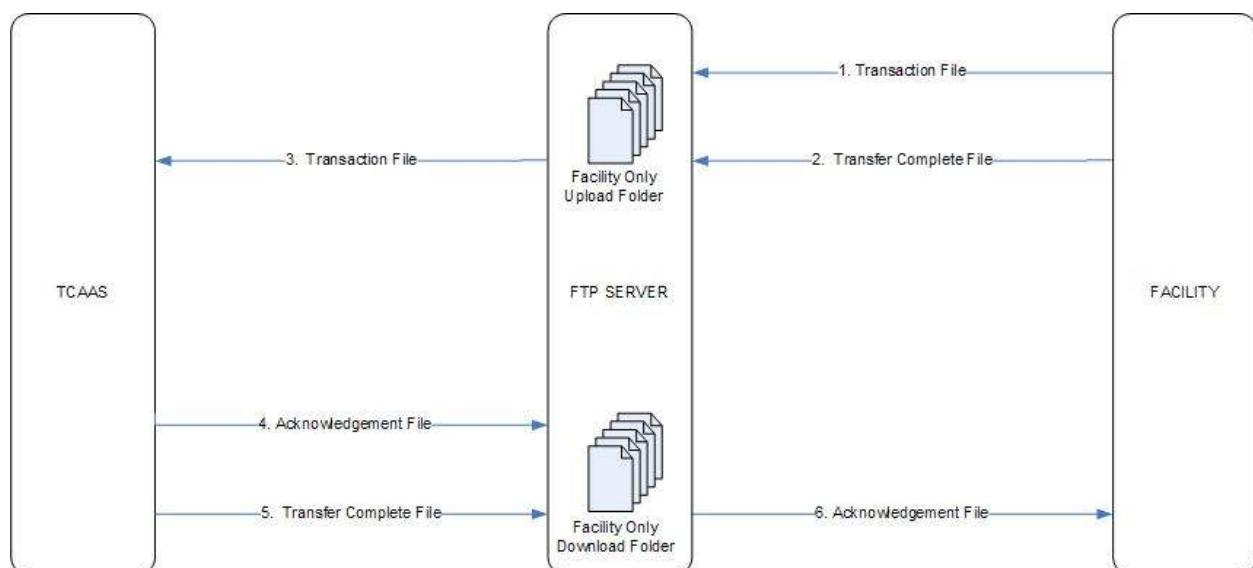
4.1 Tag Status Files

The process for transferring files Tag Status files is as follows:



4.2 Transaction Files

The process for transferring files Transaction files is as follows:



5. FAILURE PATH

The return code in the Acknowledgement file provides the organization that created the original file confirmation that the file has been successfully validated or an indication of the problem experienced by the receiving organization. The definition of the return codes and the actions to be taken when a return code is received are listed below.

Return Code	Description of problem	Actions to be taken
00	The file was successfully validated.	No further action necessary.
10	File cannot be decrypted.	<p>Verify originating organization can decrypt file. Resolve encryption problems at appropriate location.</p> <p>If the original file was encrypted badly then it can be deleted from ftp server and replaced by a correctly encrypted file with the same name.</p> <p>If the problem is related to the private key used for decryption, the original encrypted file will be revalidated and a new ACK file can be created.</p>
11	File cannot be uncompressed.	<p>Verify originating organization can decompress file. Resolve decompression at appropriate location.</p> <p>If the original file was compressed badly then it can be deleted from ftp server and replaced by a correctly compressed file with the same name.</p> <p>If the problem is related to the tool used for decompressing the file, the original compressed file will be revalidated and a new ACK file can be created.</p>
12	Badly formed XML file.	<p>The file will need to be recreated by the originating organization with correctly formed XML tags.</p> <p>The file can be resubmitted with the same name and File_ID value.</p>
13	Duplicate File. File with File_ID has already been validated.	Originating organization will need to create a new file with a non duplicate FILE_ID value.
20	Validation of the summary data in the header against the detailed record data was not successful. The file was not processed by TCAAS or the Facility.	<p>Originating organization will need to confirm the data in the original file is correct.</p> <p>Errors in the file can be corrected only if they relate to the summary data. In this case, the file can be resubmitted with the same name and File_ID value.</p> <p>If the errors are related to the detailed data, then the originating organization will be required to create a new file with different name and FILE_ID value.</p>
30	Transaction records contain invalid data. TCAAS will not post these to a customer account.	The Facility will be able to obtain the number of transactions not posted using the reports provided by TCAAS.
31	Tag records contain invalid data. Facility will not update status for tag record containing invalid data.	TCAAS will review tag status in original Tag Status File. If there is an error in the Tag Status File, a new file will be created and uploaded to the ftp server.
32	Duplicate transaction. The file contains transactions with Transaction_ID values that have already been validated in another file.	Originating organization will need to correct duplicate Transaction_ID values. The file cannot be resubmitted. A new file with non duplicate Transaction_ID values will need to be created and uploaded to the ftp server.

6. SECURITY

6.1 Introduction

The data exchanged between the TCAAS and facilities will be need to be secured from unauthorized access. This section of the ICD identifies the requirements for securing the data files from unauthorized access while in transit and in storage on an ftp server.

6.2 In Transit

To prevent unauthorized access to toll data via snooping or other methods designed to intercept data, all files except the Transfer Complete (CHK) files will be encrypted and decrypted using PGP encryption methodology based on shared and private keys. PGP version 9 will be the solution required to be used for key management and file encryption/decryption.

The following tables identifies which keys will be used for specific data

Data exchange	Encryption method	Decryption method
All files except Transaction Files	Shared key generated by TCAAS and distributed to all Facilities	Private key generated by TCAAS and distributed to all Facilities
Transaction Files	Unique shared key for specific facility generated by TCAAS	Unique private key for specific facility generated by TCAAS. Only distributed to specific facility.

These keys will be provided to the facilities on a CD 30 days prior to start of TCAAS-facility integration testing.

6.3 In Storage

6.3.1 Ftp Server

The ftp server managed by TCAAS will include the following folder on the ftp server:

- Tag Status File Folder - contains files uploaded by TCAAS. TCAAS will have read/write/delete access, but will not have update access (to prevent file renaming). Access control will be restricted to read only permissions for all facilities.
- Facility Only Download Folder - contains files to be downloaded by only one Facility. There will be one of these folders for each Facility using TCAAS for CSC functions. Access control will be restricted to only one Facility with read only permissions. TCAAS will have read/write/delete access, but will not have update access (to prevent file renaming).
- Facility Only Upload Folder - contains files to be uploaded by only one Facility. There will be one of these folders for each Facility using TCAAS for CSC functions. Access control will be restricted to only one Facility with read/write permissions, but not update permissions (to prevent file renaming). TCAAS will have read/delete access permissions to this folder.

Internal, local user access to these folders will only be enabled for administrators and specific users with access to other secure toll data within the TCAAS network. Non Authorized users with access to the network on which the ftp server is located will not be given read permissions to any folders used by the ftp server or used to archive files exchanged between TCAAS and Facilities.

External Access to the login prompt for the ftp server will be restricted by IP address. If an IP address attempts to access the ftp server and it is not on the permitted list of IP addresses, access to the FTP server will not be allowed. A valid username/password combination will also be required to authenticate valid users and provide access to ftp folders.

7. DATA ELEMENTS

Data Element Name	Comments	XML Data Type	TCAAS DB Data Type
AVC_CLASS	Class of the vehicle according to the automatic vehicle classification system in the lane.	positiveInteger	SMALLINT, >0
DESCRIPTION	Description of error to assist Facility or TCAAS with debugging the problem.	string	VARCHAR(500)
ENTRY_LANE_NO	Lane number associated with transaction.	positiveInteger	SMALLINT, >0
ENTRY_PLAZA_NO	Plaza number associated with transaction.	positiveInteger	SMALLINT, >0
ENTRY_TRANS_DATE_TIME	YYYY-MM-DDThh:mm:ss.. Date/time transaction occurred in the lane.	dateTime	DATETIME
FAC_ID	Facility ID for remote locations using TCAAS for CSC functions.	positiveInteger	SMALLINT, >0
FILE_DATE_TIME	YYYY-MM-DDThh:mm:ss. Date file created.	dateTime	DATETIME
FILE_ID	Server generated transaction ID, which uniquely identifies the file.	positiveInteger	SMALLINT, >0
FILENAME	Name of file associated with Transfer Complete file.	string	VARCHAR(500)
FILETYPE	Type of file associated with Transfer Complete file.	string	VARCHAR(100)
NUM_ERRORS	Count of issues (errors or informational warnings) contained within the Acknowledgement file.	unsignedLong	SMALLINT, >0
RECORD_ID	Server generated record ID, which uniquely identifies a record within a specific file.	unsignedLong	SMALLINT, >0
RETURN_CODE	Issue (Error or informational warning) associated with the file. CODE DESCRIPTION 00 The file was successfully validated. 10 File cannot be decrypted. 11 File cannot be uncompressed. 12 Badly formed XML file. 13 Duplicate File_ID 20 Summary data validation failed. 30 Transaction records contain invalid data. 31 Tag records contain invalid data. 32 Duplicate Transaction_ID	positiveInteger	SMALLINT, >0
SPECIAL_RULE_APPLIED	Notification if a special business rule was applied to the transaction. Value Description SR167-Y Toll reduced to lower fare SR167-N Toll not changed.	string	VARCHAR(100)
TAG_AGENCY_ID	Agency ID associated with the Tag.	positiveInteger	SMALLINT, >0
TAG_CLASS	Class associated with the tag.	positiveInteger	SMALLINT, >0
TOTAL_TAG_COUNT_STATUS_0	Count of tags with status 0 in the Tag Status File.	unsignedLong	INT, >0
TOTAL_TAG_COUNT_STATUS_1	Count of tags with status 1 in the Tag Status File.	unsignedLong	INT, >0

Data Element Name	Comments	XML Data Type	TCAAS DB Data Type
TOTAL_TAG_COUNT_STATUS_2	Count of tags with status 2 in the Tag Status File.	unsignedLong	INT, >0
TOTAL_TAG_COUNT_STATUS_3	Count of tags with status 3 in the Tag Status File.	unsignedLong	INT, >0
TOTAL_TAG_COUNT_STATUS_4	Count of tags with status 4 in the Tag Status File.	unsignedLong	INT, >0
TOTAL_TAG_COUNT_STATUS_5	Count of tags with status 5 in the Tag Status File.	unsignedLong	INT, >0
TAG_HW_SERIAL_NUMBER	Hardware serial number associated with the tag. This is required for eGo Plus tags.	string	VARCHAR(32)
TAG_NUMBER	Serial number used to refer to the tag.	Long	INT, >0
TAG_PROTOCOL	Type of tag associated with number <u>VALUES</u> SEGO CVISN	string	VARCHAR(10)
TAG_REVENUE_TYPE	Revenue status of the Tag. (Applicable for all locations) <u>VALUES</u> REVENUE NONREVENUE	string	VARCHAR(10)
TAG_STATUS	<u>VALUE</u> <u>DESCRIPTION</u> 0 VALID 1 LOW BALANCE 2 INSUFFICIENT FUNDS 3 VERIFY – RESERVED FOR TRANSCORE USE 4 INVALID 5 LOST/STOLEN	positiveInteger	SMALLINT, >0
TOTAL_TAG_COUNT	Count of tags contained within the Tag status File	unsignedLong	INT, >0
TOLL	Amount of the Toll that is due to be deducted from a customer's account at the CSC.	decimal	SMALLINT, >0
TRANSACTION_COUNT	Count of transactions contained within the Transaction file.	unsignedLong	INT, >0
TRANSACTION_ID	Server generated transaction ID, which uniquely identifies a transaction.	unsignedLong	INT, >0
TRANSACTION_SUM	Sum of Toll data elements for all transactions in the Transaction File.	decimal	MONEY, >0
TRIP_SPEED	Speed of the vehicle as determined by the SR167 lane controller.	decimal	DECIMAL >0
TX_CLASS	Class associated with the transaction.	positiveInteger	SMALLINT, >0

Appendix A Tag Status File XML Schema

```
<xs:schema targetNamespace="http://localhost/SR167"
    xmlns:tsf="http://localhost/SR167"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="qualified">

<xs:simpleType name="tagStatusType">
    <xs:restriction base="xs:positiveInteger">
        <xs:pattern value="[0-5]" />
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="tagRevenueType">
    <xs:restriction base="xs:string">
        <xs:enumeration value="REVENUE" />
        <xs:enumeration value="NONREVENUE" />
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="tagProtocolType">
    <xs:restriction base="xs:string">
        <xs:enumeration value="SEGO" />
        <xs:enumeration value="CVISN" />
    </xs:restriction>
</xs:simpleType>
<xs:element name="TAG_STATUS_FILE_1.0">
<xs:complexType>
    <xs:sequence minOccurs="1" maxOccurs="1">
        <xs:element name="HEADER">
            <xs:complexType>
                <xs:sequence minOccurs="1" maxOccurs="1">
                    <xs:element name="FILE_DATE_TIME" type="xs:dateTime" />
                    <xs:element name="TOTAL_TAG_COUNT" type="xs:unsignedLong" />
                    <xs:element name="TOTAL_TAG_COUNT_STATUS_0" type="xs:unsignedLong" />
                    <xs:element name="TOTAL_TAG_COUNT_STATUS_1" type="xs:unsignedLong" />
                    <xs:element name="TOTAL_TAG_COUNT_STATUS_2" type="xs:unsignedLong" />
                    <xs:element name="TOTAL_TAG_COUNT_STATUS_3" type="xs:unsignedLong" />
                    <xs:element name="TOTAL_TAG_COUNT_STATUS_4" type="xs:unsignedLong" />
                    <xs:element name="TOTAL_TAG_COUNT_STATUS_5" type="xs:unsignedLong" />
                </xs:sequence>
            </xs:complexType>
        </xs:element>
        <xs:element name="DETAIL_DATA">
            <xs:complexType>
                <xs:sequence minOccurs="0" maxOccurs="unbounded">
                    <xs:element name="TAG">
                        <xs:complexType>
                            <xs:sequence minOccurs="1" maxOccurs="1">
                                <xs:element name="RECORD_ID" type="xs:unsignedLong" />
                                <xs:element name="TAG_AGENCY_ID" type="xs:positiveInteger" />
                                <xs:element name="TAG_PROTOCOL" type="tsf:tagProtocolType" />
                                <xs:element name="TAG_REVENUE_TYPE" type="tsf:tagRevenueType" />
                                <xs:element name="TAG_NUMBER" type="xs:long" />
                                <xs:element name="TAG_HW_SERIAL_NUMBER" type="xs:string" minOccurs="0" />
                                <xs:element name="TAG_CLASS" type="xs:positiveInteger" />
                                <xs:element name="TAG_STATUS" type="tsf:tagStatusType" />
                            </xs:sequence>
                        </xs:complexType>
                    </xs:element>
                    <xs:sequence>
                </xs:complexType>
            </xs:element>
            <xs:element name="FOOTER">
            </xs:element>
        </xs:sequence>
    </xs:complexType>
</xs:element>
</xs:schema>
```


Appendix B Transaction File XML Schema

```
<xs:schema targetNamespace="http://localhost/SR167"
    xmlns:tsf="http://localhost/SR167"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="qualified">
<xs:simpleType name="specialRuleType">
    <xs:restriction base="xs:string">
        <xs:enumeration value="SR167-Y"/>
        <xs:enumeration value="SR167-N"/>
    </xs:restriction>
</xs:simpleType>
<xs:element name="TRANSACTION_FILE_1.0">
    <xs:complexType>
        <xs:sequence minOccurs="1" maxOccurs="1">
            <xs:element name="HEADER">
                <xs:complexType>
                    <xs:sequence minOccurs="1" maxOccurs="1">
                        <xs:element name="FAC_ID" type="xs:positiveInteger"/>
                        <xs:element name="FILE_ID" type="xs:positiveInteger"/>
                        <xs:element name="FILE_DATE_TIME" type="xs:dateTime"/>
                        <xs:element name="TRANSACTION_COUNT" type="xs:unsignedLong"/>
                        <xs:element name="TRANSACTION_SUM" type="xs:decimal"/>
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
            <xs:element name="DETAIL_DATA">
                <xs:complexType>
                    <xs:sequence minOccurs="0" maxOccurs="unbounded">
                        <xs:element name="TRANSACTION">
                            <xs:complexType>
                                <xs:sequence minOccurs="1" maxOccurs="1">
                                    <xs:element name="RECORD_ID" type="xs:unsignedLong"/>
                                    <xs:element name="TRANSACTION_ID" type="xs:unsignedLong"/>
                                    <xs:element name="TAG_AGENCY_ID" type="xs:positiveInteger"/>
                                    <xs:element name="TAG_NUMBER" type="xs:long"/>
                                    <xs:element name="ENTRY_TRANS_DATE_TIME" type="xs:dateTime"/>
                                    <xs:element name="ENTRY_PLAZA_NO" type="xs:positiveInteger"/>
                                    <xs:element name="ENTRY_LANE_NO" type="xs:positiveInteger"/>
                                    <xs:element name="TX_CLASS" type="xs:positiveInteger"/>
                                    <xs:element name="AVC_CLASS" type="xs:positiveInteger" minOccurs="0"/>
                                    <xs:element name="TAG_CLASS" type="xs:positiveInteger" minOccurs="0"/>
                                    <xs:element name="TOLL" type="xs:decimal"/>
                                    <xs:element name="SPECIAL_RULE_APPLIED" type="tsf:specialRuleType"/>
                                    <xs:element name="TRIP_SPEED" type="xs:decimal" minOccurs="0"/>
                                </xs:sequence>
                            </xs:complexType>
                        </xs:element>
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
            <xs:element name="FOOTER">
                </xs:element>
            </xs:sequence>
        </xs:complexType>
    </xs:element>
</xs:schema>
```

Appendix C Transfer Complete File XML Schema

```
<xs:schema targetNamespace="http://localhost/SR167"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="qualified">
<xs:element name="TRANSFER_COMPLETE_1.0">
    <xs:complexType>
        <xs:sequence minOccurs="1" maxOccurs="1">
            <xs:element name="DETAIL_DATA">
                <xs:complexType>
                    <xs:sequence minOccurs="0" maxOccurs="1">
                        <xs:element name="FILE">
                            <xs:complexType>
                                <xs:sequence minOccurs="1" maxOccurs="1">
                                    <xs:element name="FILENAME" type="xs:string"/>
                                    <xs:element name="FILETYPE" type="xs:string"/>
                                </xs:sequence>
                            </xs:complexType>
                        </xs:element>
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
        </xs:sequence>
    </xs:complexType>
</xs:element>
</xs:schema>
```

Appendix D Acknowledgement File XML Schema

```
<xs:schema targetNamespace="http://localhost/SR167"
    xmlns:tsf="http://localhost/SR167"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="qualified">

<xs:simpleType name="ackReturnCode">
    <xs:restriction base="xs:integer">
        <xs:enumeration value="0"/>
        <xs:enumeration value="10"/>
        <xs:enumeration value="11"/>
        <xs:enumeration value="12"/>
        <xs:enumeration value="13"/>
        <xs:enumeration value="20"/>
        <xs:enumeration value="30"/>
        <xs:enumeration value="31"/>
        <xs:enumeration value="32"/>
    </xs:restriction>
</xs:simpleType>
<xs:element name="ACKNOWLEDGEMENT_1.0">
    <xs:complexType>
        <xs:sequence minOccurs="1" maxOccurs="1">
            <xs:element name="HEADER">
                <xs:complexType>
                    <xs:sequence minOccurs="1" maxOccurs="1">
                        <xs:element name="FILENAME" type="xs:string"/>
                        <xs:element name="FILETYPE" type="xs:string"/>
                        <xs:element name="RETURN_CODE" type="tsf:ackReturnCode"/>
                        <xs:element name="NUM_ERRORS" type="xs:unsignedLong" minOccurs="0"/>
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
            <xs:element name="DETAIL_DATA">
                <xs:complexType>
                    <xs:sequence minOccurs="0" maxOccurs="unbounded">
                        <xs:element name="ERROR">
                            <xs:complexType>
                                <xs:sequence minOccurs="1" maxOccurs="1">
                                    <xs:element name="RECORD_ID" type="xs:unsignedLong"/>
                                    <xs:element name="DESCRIPTION" type="xs:string"/>
                                </xs:sequence>
                            </xs:complexType>
                        </xs:element>
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
            <xs:element name="FOOTER">
            </xs:element>
        </xs:sequence>
    </xs:complexType>
</xs:element>
</xs:schema>
```